Jabalpur Engineering College, Jabalpur

(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)

(AICTE Model Curriculum Based Scheme)

Bachelor of Technology (B.Tech.) VIII Semester (Electrical Engineering)

w.e.f. July 2023

S.No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours Per Week			Total Credits
				Theory			Practical						
				End. Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work		L	T	P	
1	EE81	PEC/DLC	Professional Elective Course-IV	70	20	10	-	-	100	3	1	-	4
2	EE82	OEC/DLC	Open Elective Course-III	70	20	10	-	-	100	3	1	-	4
3	EE83	PI	Major Project / Internship	-	-	-	150	100	250	-	-	16	8
			Total	140	40	20	150	100	450	**6**	**2**	**16**	**16**

Note: 1. Departmental BOS will decide list of three/four optional subjects those are available in MOOC/NPTEL, PEC as well for OEC.

Professional Elective Course-IV		
S.No.	**Subject Code**	**Subject Name**
1	EE81A	Process Control
2	EE81B	SCADA System & Applications
3	EE81C	Renewable & Non Conventional Energy Sources

Open Elective Course-III		
S.No.	**Subject Code**	**Subject Name**
1	EE82A	Embedded Systems
2	EE82B	Intellectual Property Rights (IPR)
3 ★	EE82C	Advanced Digital Signal Processing

Note: 2. Students going for internship would have to opt MOOC/NPTEL subjects decided / listed by the HOD / Coordinator.

Professional Elective Course-IV		
S.No.	**Subject Code**	**Subject Name**
1	EE81D	NPTEL-1
2	EE81E	NPTEL-2
3	EE81F	NPTEL-3

Open Elective Course-III		
S.No.	**Subject Code**	**Subject Name**
1	EE82D	NPTEL-4
2	EE82E	NPTEL-5
3	EE82F	NPTEL-6

Note: 3. For Major Project/ Internship, evaluation is based on work done, quality of report, presentation and performance in viva-voce through department project supervisor / Industry Project Coordinator.

1 hour lecture (L) = 1 credit	1 hour Tutorial (T) = 1 credit	2 hour Practical (P) = 1 credit

PEC: Professional Elective Course, OEC: Open Elective Course, PI: Project and Internship, DLC: Distance Learning Course

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		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid-Sem Exam	Quiz/ Assignment	End Sem	Lab work					
EE81A	Process Control	70	20	10	-	-	100	3	1	-	4

PROCESS CONTROL

Module-I
Special characteristics of process systems large time constants, interaction, multistaging, pure lag; control loops for simple systems and their Dynamics & stability.

Module-II
Generation of control action in electronic and pneumatic controllers. Control valves, valve positioners, relief and safety valves, relays, volume boosters, pneumatic transmitters for process variable. Tuning of controllers - Zeigler Nichols and other techniques.

Module-III
Different control techniques and interaction of process parameters e.g. feed forward, cascade, ratio, override controls Batch continuous process controls. Feed forward Control schemes.

Module-IV
Various process schemes / unit operations and their control schemes e.g. distillation columns, absorbers, heat exchangers, furnaces, reactors, mineral processing industries, etc. Use of control schemes for process optimization.

Module-V
Advanced control strategies with case studies. Use of DDC and PLC. Introduction to supervisory control. Conversion of existing control schemes in operating plants, data loggers.

Text Books:

1. Dale R.Patrick, Stephen W.Fardo, "Industrial Process Control Systems", Second Edition.
2. F.G.Shinskey, "Process Control Systems", McGraw Hill ,Third Edition.

Reference Book:

1. Carlos A. Smith C.A. & A.B. Corripio, "Principle & Practiced Automatic Process Control", Third Edition.

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Course Code : EE81A
Course Category : PEC
Course Name : Process Control

After completion of this course student will be able to-

CO1: Identify different process dynamics in process industries and their control schemes.

CO2: Analyze and Design different types of mechanical, optical sensor and actuators.

CO3: Differentiate process controller's their stability and tuning.

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		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid-Sem Exam	Quiz/ Assignment	End Sem	Lab work					
EE81B	SCADA System & Applications	70	20	10	-	-	100	3	1	-	4

SCADA SYSTEM & APPLICATIONS

Module-I
Introduction to SCADA and PLC: SCADA: Data acquisition system, evaluation of SCADA, communication technologies, monitoring and supervisory functions. PLC: Block diagram, programming languages, Ladder diagram, Functional Block diagram, Applications, Interfacing of PLC with SCADA.

Module-II
SCADA system components: Schemes, Remote Terminal Unit, Intelligent Electronic Devices, Communication Network, SCADA server.

Module-III
SCADA Architecture-Various SCADA Architectures, advantages and disadvantages of each system, single unified standard architecture IEC 61850 SCADA / HMI Systems.

Module-IV
SCADA Communication-Various industrial communication technologies- wired and wireless methods and fibre optics, open standard communication protocols.

Module-V
Operation and control of interconnected power system-Automatic substation control, SCADA configuration, Energy management system, system operating states, system security, state estimation. Unit
VI: SCADA applications Utility applications, transmission and distribution sector operation, monitoring analysis and improvement. Industries oil gas and water. Case studies, implementation, simulation exercises.

Text Book:
1. Stuart A Boyer, "SCADA supervisory control and data acquisition", First Edition.

Reference Book:
1. Gordan Clark, Deem Reynders, "Practical Modem SCADA Protocols", First Edition.

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Course Code : EE81B
Course Category: PEC
Course Name : SCADA System & Applications

After completion of this course student will be able to-

CO1: Understanding of Supervisory control & Data acquisition.

CO2: Design of SCADA systems with establishment of communication protocols.

CO3: Application of the SCADA to utilities for their operation & control.

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		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid-Sem Exam	Quiz/ Assignment	End Sem	Lab work					
EE81C	Renewable & Non-Conventional Energy Sources	70	20	10	-	-	100	3	1	-	4

RENEWABLE & NON-CONVENTIONAL ENERGY SOURCES

Module-I

Renewable Energy Systems Energy Sources, Comparison of Conventional and non-conventional, renewable and non-renewable sources. Statistics of world resources and data on different sources globally and in Indian context, Significance of renewable sources and their exploitation, Energy planning, Energy efficiency and management.

Module-II

Wind Energy System Wind Energy, Wind Mills, and Grid connected systems. System configuration, working principles, limitations, Effects of wind speed and grid conditions, Grid independent systems - wind-battery, wind diesel, wind hydro biomass etc. wind operated pumps, controller for energy balance .Small Hydro System Grid connected system, system configuration, working principles, limitations. Effect of hydro potential and grid condition, Synchronous versus Induction Generator for standalone systems, Use of electronic load controllers and self-excited induction generators Wave Energy System: System configuration: grid connected and hybrid systems.

Module-III

Solar Radiation Extra-terrestrial solar radiation, terrestrial solar radiation, Solar thermal conversion, Solar Photo tonic System Solar cell, Solar cell materials, efficiency, Characteristics of PV panels under varying insulation. PV operated lighting and water pumps, characteristics of motors and pumps connected to PV panels.

Biomass Energy System: System configuration, Biomass engine driven generators, feeding loads in stand-alone or hybrid modes, Biomass energy and their characteristics.

Module-IV

Energy from oceans Ocean temperature difference, Principles of OTEC, plant operations,

Geothermal Energy Electric Energy from gaseous cells, Magneto-hydro generated energy, Non-hazardous energy from nuclear wastes, Possibilities of other modern non-conventional energy sources.

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Module-V

Electric Energy Conservation Energy efficient motors and other equipment, Energy saving in Power Electronic controlled drives. Electricity saving in pumps, air-conditioning, power plants, process industries, illumination etc., Methods of Energy Audit

Measurements systems; efficiency measurements energy regulation, typical case studies, various measuring devices analog and digital, use of thyristors.

Text Books:

1. John Twidell & Toney Weir, "Renewable Energy Resources", E & F N Spon, Third Edition.
2. El-Wakil, "Power Plant Technology", McGraw Hill, First Edition.
3. Rai G D, "Non-conventional Energy Resources", Khanna Publication, Third Edition.

Reference Books:

1. F Howard E. Jordan, "Energy-Efficient Electric Motor & their Application", Plenum Press, New York, USA, Second Edition.
2. Anna Mani, "Wind Energy Resource Survey", Allied Publishers Ltd., New Delhi, Second Edition.

Course Code : EE81C
Course Category : PEC
Course Name : Renewable & Non-Conventional Energy Sources

After completion of this course student will be able to-

CO1: Understand the need of energy conversion and the various methods of energy storage.

CO2: Explain the field applications of renewable energy sources.

CO3: Illustrate the concepts of Direct Energy Conversion systems & their applications.

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		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid-Sem Exam	Quiz/ Assignment	End Sem	Lab work					
EE82A	Embedded Systems	70	20	10	-	-	100	3	1	-	4

EMBEDDED SYSTEMS

Module-I:
Introduction: Embedded Systems and general purpose computer systems, history, classifications, applications and purpose of embedded systems. Core of Embedded Systems: Microprocessors and micro controllers, RISC and CISC controllers, Big endian and Little endian processors, Application specific ICs, Programmable logic devices, COTS, sensors and actuators, communication interface, embedded firmware, other system components, PCB and passive components.

Module-II:
Characteristics and quality attributes of embedded systems: Characteristics, Operational and non- operational quality attributes, application specific embedded system - washing machine, domain specific - automotive.

Module-III:
Programming Embedded Systems: Structure of embedded program, infinite loop, compiling, linking and locating, downloading and debugging.

Module-IV:
Embedded hardware : Memory map, i/o map, interrupt map, processor family, external peripherals, memory - RAM, ROM, types of RAM and ROM, memory testing, CRC, Flash memory.
Peripherals: Control and Status Registers, Device Driver, Timer Driver-Watchdog Timers, Embedded Operating System, Real-Time Characteristics, Selection Process.

Module-V:
Design and Development: Embedded System development environment - IDE, Types of file generated on cross compilation, disassembler / decompilers, simulator, emulator and debugging, embedded product development life-cycle, trends in embedded industry.

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Text Books:

1. Michael Barr, "Programming Embedded Systems in C and C++", O' Reilly media, inc.
2. Shibu K V, "Reilly Introduction to embedded systems", Tata McGraw-Hill, Second Edition

Reference Book:

1. Embedded Systems, Rajkamal, TataMcGraw-Hill, Second Edition.

Course Code : EE82A
Course Category: OEC
Course Name : Embedded Systems

After completion of this course student will be able to-

CO-1: Explain the embedded system concepts and architecture of embedded systems

CO-2: Describe the architecture of 8051 microcontroller and write embedded program for 8051 microcontroller.

CO-3: Select elements for an embedded systems tool.

CO-4: Understand the memory types used in embedded systems.

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		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid-Sem Exam	Quiz/ Assignment	End Sem	Lab work					
EE82B	Intellectual Property Rights (IPR)	70	20	10	-	-	100	3	1	-	4

Intellectual Property Rights

Module–I:
Understanding and Overview of the IPR Regime: Introduction, types of intellectual property- Industrial property, Artistic and Literary Property, Sui Generis systems. Need for intellectual property rights, Rationale for protection of IPR, Impact of IPR on development, health agriculture and genetic resources, IPR in India - Genesis and Development, IPR in abroad- Some important examples of IPR, International organizations, agencies and treaties,

Module–II:
Patents-Trips Definition, kind of inventions protected by patent-Patentable and Non patentable inventions, Process and product patent, double patent — patent of addition. Legal requirements for patents-Granting of patent - Rights of a patent-exclusive right Patent application process: Searching a patent- Drafting of a patent- Filing of a patent- Types of patent applications- Patent document: specification and claims. Management of IP Assets and IP portfolio — Commercial exploitation of IP-Assignment, licensing. Infringement, The different layers of the international patent system: national, regional and international options.

Module–III:
Trademarks- Rights of trademark- kind of signs used as trademarks-types, purpose and functions of a trademark, trademark protection, trademark registration, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

Module–IV:
Copyrights- Rights and protection covered by copyright - Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, obtaining copy right registration, notice of copy right, international copy right law. Infringement of Copyright under Copyright Act Related Rights - Distinction between related rights and copyright. Celebrity rights, Academic integrity or Plagiarism: An Intellectual Theft, The Role and Liabilities of IPRs in India - Cyber law issues: Criminal law, data safety, online privacy, Health privacy, freedom of expression and human rights, net, neutrality, national security

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Module–V:
Geographical Indication of Goods: Types, why and how GI need protection and GI laws, Indian GI act. Traditional Knowledge: Indigenous, medicinal, bioprospecting knowledge Examples, Need for protection, positive protection, defensive protection, legal aspects.

Text Books:

1. K.Bansal & P.Bansal, "Fundamentals of Intellectual Property for Engineers", BS Publication Deborah, E. Bouchoux, "Intellectual property", Fourth Edition.
2. Prabuddha Ganguli, "Intellectual property right-Unleashing the knowledge economy", Tata McGraw Hill Publishing Company Ltd., First Edition.

Reference Book:

1. Neeraj Pandey, "Intellectual property Rights", PHI India, First Edition

Course Code : EE82B
Course Category: OEC
Course Name : Intellectual Property Rights (IPR)

After completion of this course student will be able to-

CO1: Students will be able to understand Primary forms of IPR.

CO2: Students will be able to asses and critique some basic theoretical justification for major forms of IPR Protection

CO3: Students will be able to compare and contrast the different forms of IPR in terms of key differences and similarities.

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EE82C	Advance Digital Signal Processing	70	20	10	-	-	100	3	1	-	4

ADVANCED DIGITAL SIGNAL PROCESSING

Module-I: Discrete-Time Random Signals
Discrete random process —Ensemble averages, Stationary and ergodic processes, Autocorrelation and Auto covariance properties and matrices, Response of LTI systems to random processes Power Spectral Density, Some useful random process models.

Module-II: Linear Estimation and Prediction
Estimation of mean, variance and covariance, Estimation theory, Spectrum estimation, Optimum Linear filters, Optimal FIR (Wiener) filter, Extraction of signal from noise, forward and backward Linear prediction and all-pole signal modeling.

Module-III: Speech and Audio Processing
Audio Signal Characteristics, Production model, Hearing and Auditory model, Acoustic characteristic of speech, Speech production models, Linear Separable equivalent circuit model, Vocal Tract and Vocal Cord Model. Audio signal acquisition, Representation and Modeling, Enhancement of audio signals: Spectral Subtraction, Weiner based filtering, neural nets.

Module -IV: Adaptive Filtering:
Concept of adaptive filtering, Method of Steepest descent, LMS adaptive filters: Structure and operation of LMS algorithm, Statistical LMS theory, Other LMS based algorithms, RLS algorithm.

Module-V: Introduction to Wavelets:
Piecewise constant approximation - the Haar wavelet, Building up the concept of dyadi Multiresolution Analysis (MRA), Relating dyadic MRA to filter banks, review of discrete signal processing, Elements of multirate systems and two-band filter bank design for dyadic wavelets, The Uncertainty Principle and its implications: the problem and the challenge that Nature imposes, The importance of the Gaussian function.

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Text Books:

1. D.G.Manolakis and V.K.Ingle "Applied Digital Signal Processing Theory and Practice", Cambridge University Press, First Edition.
2. S.K.Mitra, "Digital Signal Processing A computer based approach", TMH,Fourth Edition.
3. Simon Haykin, "Adaptive Filter Theory",Pearson Education India, Fourth Edition.

Reference Books:

1. Vikram Gadre and Aditya Abhyankar, "Multiresolution and Multirate Signal Processing" McGraw Hill Education, First Edition.
2. Sen, Soumya, Dutta, Anjan, Dey, Nilanjan, "Audio Processing and Speech Recognition", First Edition.
3. Y.T. Chan, "Wavelet Basics", Kluwer Publishers, Boston, 1993.
4. C.Widrow and S.D. Stearns, "Adaptive signal processing", Prentice Hall, First Edition.

Course Code : EE82C
Course Category:OEC
Course Name : Advanced Digital Signal Processing

After completion of this course students will be able to –

CO1: Analyze and apply the concepts of random processes in practical applications.

CO2: Analyze and apply linear estimation and prediction techniques for a given random process.

CO3: Analyze, mathematically model, modify and enhance speech and music signals.

CO4: Analyze and apply appropriate adaptive algorithm for processing non-stationary signals.

CO5: Analyze and apply wavelet transforms for signal and image processing based applications.

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